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Some Observations on Treating Cases of Diphtheria.

Read in the Section on Diseases of Children, at the Forty-fourth Annual Meeting of the American Medical Association.

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SOME OBSERVATIONS ON TREATING CASES OF DIPHTHERIA.

There is, perhaps, no subject at this time exciting more and deeper interest in the profession, certainly there is none more important than the management of cases of diphtheria. In this connection some general remarks seem necessary with reference to the ravages of the disease. The excess of deaths over births, which is depopulating the French nation to-day, is largely due to diphtheria. In England it is not confined to the large cities alone, but the rural districts are feeling its scourge.[1] The same may be said of the United States, where there is a growing dread of the disease and justly so, because of the gradual increase of cases, and deaths as well, which quite an extended correspondence with the different State Boards of Health, also the mortuary registers show, conclusively proving two things: 1, its infectiousness; 2, that the general efforts now put forth to stay its progress are inadequate.

As to its infectiousness in man, this has long since been settled in the affirmative and the question now is, What creature is not subject to the disease? since flying fowl, creeping beast, as domestic animals or pets, are susceptible, and like flies have the credit of conveying the disease. The cat's ability to contract and transmit diphtheria to persons has long been observed.[2] Animal susceptibility to inoculations with diphtheria exudate and cultures of the same, has frequently been utilized; making them the experimenting ground by which important data have been obtained; settling the question as to whether diphtheria is primarily a local, or a constitutional disease, in favor of the former. This has been proven by the elaborate investigations of Wood and Formad, Klebs, Löffler, Abbott, Welch and many others. But for the specific cause of the contagion we are indebted

[1] Thorne Thorne's Work. England.
[2] Noah Webster's Epidemic and Pestilential Diseases.

to Löffler for his discovery of the diphtheria bacillus, which bears his name. And no less important are the investigations of Abbott and Welch, who have established the fact that in the Löffler bacillus, we have the etiology of diphtheria, a factor of paramount importance in regard to its rational treatment and prophylaxis, again to be referred to.

With reference to the present effort not being adequate to stop the progress of the disease, we have to say that while this is true generally throughout the States, we are glad for one single exception which stands out conspicuously and alone, and is worthy of our respect and emulation. We have reference to Michigan and its State Board of Health, backed as it is by legislative enactments, not only requiring scientific investigation of disease and tabulating the same, but by an enforced system of isolation and disinfection, which had reduced, in 1889, the average number of cases per outbreak from 11.66, in which isolation and disinfection was neglected, to 1.56 when it was enforced, and deaths were reduced from 2.65 to .22,[3] showing very plainly that the disease can not only be controlled, but that there is a possibility of stamping it out entirely. Until other States are guided by the State of Michigan, they will continue to write large bills of mortality; which brings us to the vital question of .

ISOLATION.

In the management of cases of diphtheria, after what has been said it seems unnecessary at this late date and time to do more than refer to the excellent restrictions and preventions, even to minute details, issued and gratuitously furnished by a number of the State and local Boards of Health. But the great necessity is to have *enforced isolation*. Isolation, if not efficient, is no isolation at all. For instance, to quarantine the house is not isolation, when there is only a board fence or a wall to scale, between the quarantined and coveted liberty. Neither is it isolation, even against the physician's protest, for a

[3] Restrictions and Preventions of Diphtheria. Michigan State Board of Health. Printed 1892.

mother of a poor family to separate and nurse one of her children sick with diphtheria in a down stairs, badly ventilated room, from the vitiated atmosphere of which she emerges to supply the others with the food which the husband is compelled to be absent to provide; for soon the whole family becomes a prey for the disease. To meet such an emergency one of two things is necessary: a nurse must be provided by the health authorities, or the patient removed to a hospital adapted especially for contagious cases. Hence the great need for the latter, and provision for the former. Therefore, to have efficient isolation we must have the State's legal enactments and popular support, as well as public and private coöperation, all of which will follow in the wake of an enlightened judgment and a just appreciation of the great responsibility which one individual owes to another, and the public at large.

In view of the importance of isolation, as well as the trouble and inconvenience attending, the questions arising, What cases shall we isolate, and how shall we discriminate? are immediately forced upon us. Some cases of sore throat having an exudate are contagious and some are not. Under such circumstances it is always safe, particularly during an epidemic, to look upon all such with suspicion and treat the same as diphtheria, at the same time securing some of the exudate for microscopic examination, to determine as early as possible its true character.

The Klebs-Löffler bacillus is the only microorganism always and persistently present in the exudate which, if found, establishes the diagnosis.[4] To do this satisfactorily will require a microscope with a one-twelfth oil-immersion objective, and in some cases the bacillus may be detected by simply staining from one-half to three-fourths of an hour a film of exudate previously spread on a cover-slip in a 2 per cent. aqueous solution of gentian violet, wash in a 5 per cent. solution of acetic acid, then in

[4] Annual address on the causation of Diphtheria, by Wm. H. Welch, M.D. Transactions of Medical and Chirurgical Faculty of Maryland.

distilled water, dry in air and mount, preferably, in Canada balsam.[5] This plan, however, may be confusing just at a time when it is desired to be positive. To establish which, the inoculation of a culture fluid with a portion of the exudate will be necessary, which, after about eighteen hours in the incubator, if successful, will under the microscope reveal the character of the bacillus, which culture, if desired can be used to ascertain its pathogenic properties by inoculating a rabbit or guinea pig. If the practitioner is fortunate enough to possess a good microscope, culture incubator and other appliances, he may possibly settle the question in doubtful cases. If not he should send a sample of the exudate on clean, white paper, securely bottled, to a competent bacteriologist, who can in twenty-four hours determine its nature. Every Board of Health should have such a salaried appointee to carry out such investigations. It having been determined that the case is one of diphtheria the patient is isolated, if he has not already been, in the upper story of the house which has been previously cleaned and divested of all drapery, upholstery, carpets and everything excepting the barest necessities for the proper care and comfort of the patient, and at the disposal of the attendants, for more than one will be required in severe cases.

They should be furnished with one or more large pails containing a 1-1000 disinfecting solution of corrosive sublimate, into which bed linens and garments of whatever character should be immersed before taken from the room. Being free from the rattle of tin, two marked papiermaché basins, one to contain the disinfecting solution before mentioned, as the best in our judgment, and the other for water convenient for the attendant's ablutions after necessary contact with the patient. Two or more covered chamber buckets, one always near containing a quart or more of a solution of chlorinated lime in strength of half a pound to a gallon of water, for the reception and disinfection of alvine dejections and

[5] Löffler's Method.

promptly removed from the room, but allowed to remain in the bucket two or more hours before emptying into the closet. In this connection there should be a liberal supply of towels and soap with a view to the absolute cleanliness of the person and the surroundings. A spitting cup containing an 8 per cent. solution of carbolic acid to receive the secretions and expectorations from the mouth, throat, lungs and nose; or a better plan is to receive such material on soft muslin rags, toilet paper or small squares of cheese cloth, and immediately burned. Hence, the necessity in the room of an open grate, or stove, in which such expectorations can be cremated. Such secretions being the most infectious, because, containing the diphtheria bacillus, should be most carefully guarded and utterly destroyed. In absence of an ordinary stove, a gas or perhaps the objectionable coal oil stove, on which, with a view to prevent dryness of the air in the room and to disinfect the same, a vessel containing the following should constantly be kept simmering, a modification, we believe, originally suggested by Dr. J. Lewis Smith, N. Y.:

R	Ol. cinnamoni.	30 parts.
	Ol. eucalyp	180 "
	Acid carbolic.	220 "
	Ol. terebinth	420 "

M.: Use one ounce to a quart of water.

An adjoining room should be appropriated to the use of the attendants, to the door of which needed supplies should be brought, and from which disinfected articles be removed for further disinfection with boiling water. The visits to the kitchen by the attendants, where other members of the family are, perhaps children, should not be allowed. To, or in, this room provisions can be brought and prepared as ordered for the patient, which brings us to the subject of

FOOD.

In order to support the strength of the patient, the proper nourishment is a matter of the most vital importance. Though anorexia is generally persist-

ent, systematic feeding should be instituted early, and of such character as is suitable to the age and condition of the patient. Fluid nourishment being most tolerant to the stomach; as milk, warm or peptonized, cold milk, beef juices expressed from broiled beef, beef peptonoids and other food more concentrated, as eggs, soft boiled, eggs and milk; and when stimulants, which are required early in severe cases, eggs and milk beaten up with brandy, also milk punch, should be judiciously given.

In those cases where there is an unwillingness, or as is frequently the case, an inability to swallow nourishment, enemata of the articles just mentioned should be resorted to early, freely and continuously, until convalescence. This can not be emphasized too forcibly, for by the early and continued support and maintenance of the vital powers, we thereby assist nature to resist and withstand the septic influence of the disease, and thus we often accomplish more than by over-much medication.

LOCAL TREATMENT.

The necessity for seeing diphtheritic cases early, can not be over-estimated and in our judgment should justify the request, on the part of the family physician, for a speedy summons in time of sore throat epidemics especially; for success in a great measure will depend upon the local treatment being employed early, vigorously and with a view to destroying the diphtheria bacillus and preventing the absorption of the poison, now known to be tox-albumen. To accomplish this desirable result in

PHARYNGEAL DIPHTHERIA:

First, disinfect the throat; and second, remove the exudate as fast as it forms.

To accomplish this, begin by spraying the throat with a 1-10000 aqueous solution of mercuric chlorid, using one of the many atomizers, or if the child is sufficiently intelligent have it gargle with the same solution, which will make the throat safe to work with, to be repeated every three or four hours. Then by means of brush or cotton swab,

patiently and with care dissolve the exudate, by applying the following:

℞ Papayotin[6] or trypsin . . . . . gr. lxx
Hydrar. chlo. cor. . . . . gr. ¼
Aqua distil . . . . . f.ʒ iv
M.

Apply every half hour until the membrane is dissolved; and at the same time every half hour alternately, disinfect the throat by using one of our safest antiseptics; the peroxid of hydrogen, though not a germicide[7], accomplishes the same result by interfering with the development of the bacillus. Spray the throat, using from one-half to 15-volume solution, or full strength, which will aid in dissolving the exudate in its formative stage, but fails to do so later, when imbedded in necrotic tissue, for which reasons these applications should be faithfully applied, not even allowing the patient's sleep to interfere; for very frequently the fate of the case depends upon the first twenty-four hours of local treatment, which if persistently and efficiently done, we have reason to believe that the septic influence of the bacteria may be prevented, and instead of a lingering case, we will have a rapid recovery of the patient. We, however, can not afford to confine our remedies to one or two, but suit the remedies to the case; hence, another very valuable and safe disinfectant and good antiseptic successfully used, where the other might be inapplicable, is a 10 grain solution of the nitrate of silver. The solid stick or even a too strong solution, makes it difficult to distinguish the resulting coagulated albumen from the diphtheritic exudate; besides, we have thought that its frequent application tended or predisposed the inflamed mucous membrane to a necrotic condition finally resulting in hemorrhage.

The forcible removal of the exudate and the application by means of cotton wrapped on a pincett, of the following:

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[6] The best at our command being papoid.

[7] George M. Sternberg, MD., on Disinfection, Hare System of Practical Therapeutics.

R. Camphor. . . . . 20 parts,
Castor oil. . . . . 15 parts,
Alcohol. . . . . 10 parts,
Carbolic acid. . . . . 5 parts,
Tartaric acid. . . . . 1 part.
M.

is recommended by Grancher,[8] also Dr. Turner of Glasgow, suggests a similar treatment but uses the application of parafin. Being painful the treatment though successfully used in adults, is inappropriate with children, and further the danger of absorption from the wounded surface would be increased. The same objection would apply, it seems to us, to Dr. August Seibert's disc of hypodermic points, through which chlorin water is injected to destroy the bacillus, as it is now known that the bacilli are mostly on the surface of the membrane.

Since the use of corrosive sublimate, first by Billotte in 1876, it seems to be growing in favor. Rennert of Germany, reports repeated successes, by wiping off the exudate with the following:

Hydrarg. chlo. corrosiv. . . . . 1 part,
Acid tartaric. . . . . 5 parts,
Aqua. . . . . 1000 parts.

The remedy is being largely used in England.

In very young children, the repeated insufflation of washed sulphur, an application which can be thoroughly made where we fail with many other applications, by simply using a glass tube. The good resulting may be attributed to the disinfecting properties of sulphurous acid, set free by the oxidation of the sulphur.

As a topical remedy, we have used the perchlorid of iron in combination with glycerin, equal parts. In hemorrhagic cases it does well. With many it is the principal local treatment.

Carbolic, boracic and salicylic acid, have their appropriate use as antiseptic gargles and sprays, but as every intelligent physician has his own way of using means to ends, these with many others, if time permitted, could be named as suggestive of the fact that it is unwise to restrict our remedies, but treat

[8] Le Progress Med., Sept. 27, 1890.

each individual case, not the disease. Keeping in view and preventing if possible, the tendency of the disease to extend to the larynx as well as to the posterior nares. If to the latter we have,

NASAL DIPHTHERIA.

The nasal passage may be the primary seat of the disease; frequently, however, it is the extension of the pharyngeal affection. This complication is recognized by the forced mouth respiration, the nasal passages being closed by the swollen mucous membrane which is covered with a grayish white lining, discharging a thin acrid muco-purulent discharge which later on, becomes greenish yellow tinged with blood.

The glands in the neck soon become involved, with earlier constitutional involvement than in the simple pharyngeal variety. These unpleasant cases are difficult to manage on account of the intricate nasal passage which should be disinfected early by douching and spraying the nasal fossæ.

The former can best be done by means of a perforated flexible rubber catheter, attaching the same to any ordinary syringe, and by bending the patient's head forward, the nasal cavities can be thoroughly and effectually douched preferably with the peroxid of hydrogen, every three or four hours.

The nasal passages may be sprayed with the same remedy, also with a weak solution of carbolic acid, or the corrosive chlorid, but some instructions to the inexperienced attendant will be necessary to the careful introduction of the nozzle of the atomizer, keeping it on a level with the floor of the nasal fossæ and parallel with the septum, so as to prevent wounding and the resulting hemorrhage. The greatest cleanliness should be observed in these cases, using the 1-1000 chlorid wash, and the cremation of all nasal discharges. But as intimated the exudate may extend to the larynx and the result is the most dangerous phase.

LARYNGEAL DIPHTHERIA.

Though the duality of membranous croup and diphtheria is not absolutely settled, yet the fact of

their unity, being so regarded by physicians generally, and acted upon approvingly by boards of health is accomplishing good as a check to its spread. The bacillus may primarily attack the windpipe, but like the nasal form it is frequently the extension of the disease into the larynx. Its commencement may be recognized by a hoarse, croupy cough with aphonia and later a gradually increasing dyspnea. These symptoms sometimes subside in a few days under the internal treatment of bichlorid and spray of the same from a steam atomizer, also lime water and 2 per cent. solution of carbolic acid, or, the steam from lime slaking in any ordinary vessel having a perforated lid, to which a tin tube or pipe can be conveyed into a tent constructed over the child—not forgetting proper ventilation—or to the mouth of the patient. We can not expect, however, as much from our spraying and local applications which are so beneficial in the laryngeal and nasal form of the disease. In this connection and in this form of the disease, we wish to call attention to a remedy, the results of which have been recently so satisfactory as to justify further trial, namely, oxygen. It should be given early because of the better oxidation of the blood. The increased tone and strength, both to the nervous and muscular system resulting from the improved condition of the blood, allays nervous irritation and excitability and produces sleep. All of which tends to assist the vital powers of the system to battle with the disease. Three inhalations in succession of about twenty seconds each, allowing the gas to pass through a jar of antiseptic water should be given three or four times daily, or oftener, when there is labored breathing or a cyanotic condition. But should the dyspnea increase, preparation will have to be made to intubate or perform tracheotomy, which leads us into the domain of surgery, upon which it is not our purpose to enter, further than to state that either operation gives the patient about equal chance. Dr. Stern makes the per cent. of recoveries of the former 26 2-5 per cent. and the latter 26 1-2 per cent. The same author recommends

intubation under three and a half years of age, and after that time the preference is for tracheotomy, excepting adults. Dr. Montgomery, however, who has had a large experience in intubating writes us that he has had 44 per cent. of recoveries. But in our treatment we should not forget

CONSTITUTIONAL REMEDIES.

Just how soon the poison of diphtheria is taken up by the absorbents, and how much or how little is required to contaminate the system, we have no reliable means of determining. That it is absorbed very rapidly we have only to recall the cases in our experience of heart paralysis after a few days of illness, and the amount to produce septic influence may depend largely upon the susceptibility of the person. But Welch and Flexner have shown that 2 cc. of filtered culture fluid contained toxic properties sufficient to kill a guinea pig. So it is well to begin internal remedies early, and we can make no mistake by giving the chlorid of iron and quinin in large doses suitable to the patient three or more times daily, so as to obtain not only the tonic effect of both, but the antiseptic influence of the iron; or alternate or substitute for the iron the following:

℞. Hydrar. chlo. cor. . . . . gr. jss. (1½)
Syr. aurant rub. . . . . .
Aqua āā . . . . . f℥j.
M.

Take from one-half to a teaspoonful every six hours. The object being, as Dr. Jacobi suggests, "to have its specific counteracting effects on the diphtheritic poison in the system."

Chlorate of potash is looked upon with less favor than formerly, because of its unfavorable action upon the kidneys.

The complications or sequelæ of diphtheria in the form of paralysis of the uvula, arms or legs, can best be relieved by general tonics, change of air; we have found a sojourn by the sea of great benefit. Obstinate cases yield to hypodermic injections of strychnia, from 1-20 to 1-60 gr. three times daily. Electricity will also be of service.

Instead of summing up conclusions, allow us to say a word in reference to our future hope—

PROPHYLAXIS.

1. Against personal infection, physicians and attendants should gargle the throat, wash the nasal passages, face and hands before and after visits, in 1–1000 solution of corrosive sublimate, and nothing short of a change of garments is excusable in going from a diphtheritic case to other patients.

2. This paper would be more incomplete than it is, did we not refer to what modern bacteriologists are accomplishing for us, particularly concerning the prevention and cure of the toxic products producing the morbid symptoms which we more or less see in every case of diphtheria.

Dr. E. A. De Schweinitz, Biochemic Laboratory, Washington, D. C., replying to our query, writes: "Experiments in this country and abroad have demonstrated that a substance (albumose) exists in and can be isolated from the cultures of the diphtheria bacillus which produces, when injected into guinea pigs, immunity in those animals from this disease. Hardly had we begun to ask the question, Why can not this immunity be safely rendered to man? when we learn from Germany that 'blood serum' from immunized animals is an anti-toxine which gives immunity to the individual, and that Dr. Aronson of Berlin claims for his blood serum immunizing strength of 1–10000 for guinea pigs; for children weighing forty-four pounds, 4 ccm. given subcutaneously, which doses afford positive protection if injected before infection; being inefficient in the disease's later stages."

But "later investigations, particularly Behring, have proved that this property of blood serum to counteract the bacterial poison may be progressively intensified, so that by repeated inoculation, a complete immunizing strength can be obtained, potent even against super-virulent bacteria cultures. The injection of blood serum from such animals afforded not only protection against virulent infection, but aborted the already present infection and made it harmless, and therefore proved *a specific cure* for the indicated disease." If these facts can be established in this country and elsewhere, surely the "goal of therapeutic effort" is reached and the glory for the second Jenner is in reserve.